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Center for Coastal Physical Oceanography, Old Dominion University

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Table of Contents

Renewed Effort by Mexican Oceanographers to...
Notes From the Director...
CCPO Goes to Space
Community Outreach
Sabbatical Cowboy
Puzzler
1999 Blue Crab/National Ocean Sciences Bowl
Salinity Measurements in the Coastal Ocean
CCPO Seminar Series: Spring 1999
Just the *facts* . . .
ADK's Words of Wisdom

Renewed Effort by Mexican Oceanographers to Understand the Dynamics of Coastal Lagoons

Mexico has more than 10,000 kilometers of coastline in the Atlantic and Pacific Oceans (Figure 1). This coastline is draped with a great number of coastal lagoons and bays of different characteristics. These bodies of water usually harbor fisheries and human population centers, as well as their associated commercial activities. The visit of Dr. D. W. Pritchard to the Centro de Investigacion Cientifica y Educacion Superior de Ensenada (CICESE) in the 1970s ignited the interest of Mexican scientists to study the hydrodynamics of coastal lagoons. However, this interest waned in the late 1980s and 1990s, as Pritchard's students in Ensenada went on to pursue graduate studies or moved on to different topics. The return to Mexico of some of these researchers, jointly with the economic and social relevance of coastal lagoons, has spurred the desire of learning more about their dynamics. This knowledge is required to: (1) be able to mitigate or prevent pollution problems; (2) establish the most suitable location for aquaculture activities; (3) better manage natural resources; and (4) improve navigation safety. Mexican physical oceanographers have a renewed interest in trying to understand these systems better. Several CCPO personnel have been involved in collaborations with Mexican scientists.

In May 1998, **ARNOLDO VALLE-LEVINSON**, assistant professor; **CRISTOBAL REYES**, graduate research assistant; and **R. C. KIDD**, marine technician from the Department of Ocean, Earth, and Atmospheric Sciences, traveled to the state of Sonora to work with Juan Dworak (of the Instituto Tecnologico del Mar in Guaymas) and Jose Gomez (of CICESE). They studied the flow characteristics in Yavaros Bay (Figure 1b) as part of a regionally funded project to obtain basic information related to environmental conditions in the bay. The information will in part be used to help assess the impact of dredging a channel that will allow navigation to fishing vessels between Yavaros Bay and the adjacent water body to the west. It will also serve to help manage the clam and shrimp fisheries in the area. During the night sampling periods, the participants were treated to spectacular sightings of the phosphorescent silhouettes of

dolphins that swam near the boat. Also, everyone was rewarded, or rather, stunned by hand-size needle-fish that jumped out of the water and into the boat. Several interesting flow features were observed in the bay, such as the strong influence of bathymetry in the 1 m/s currents at the entrance. The rapid bathymetric change from the channel to the shoals gave rise to strong transverse shears in the tidal flows, which allowed the development of convergence lines that followed the bathymetry during both flood and ebb tidal stages and that may influence the productivity of this bay.

Immediately after the experience in Yavaros, Sonora, the CCPO personnel traveled in early June to the neighboring state to the south, Sinaloa, to work with another group of Mexican scientists, lead by Eugenio Gomez Reyes of the Universidad Autonoma Metropolitana. The project in which the group participated had the overall goal of studying the transport of shrimp larvae into the coastal lagoons in the vicinity of Mazatlan. The effort was concentrated in two lagoons: Huizache-Caimanero and Ceuta. CCPO personnel contributed in the deployment of moored instrumentation and in the towing of a current profiler off an inlet of one lagoon. The reward of this experience was the excitement of towing the current profiler at night, from a "chocolata" (you will need a Mexican to interpret this meaning, or call CCPO, or e-mail Cristobal *creyes@ccpo.odu.edu*)) boat with an overheated engine, with no navigation lights, no radio, no spot lights, very close to a groin and breaking waves, in the middle of a practically uninhabited region (no lights for reference on land), and in the close vicinity of a fishing vessel. After all, everyone was glad to return safe and sound to their point of departure. Three months later, they were also glad to recover the moored instruments. The time series of the current profilers showed periods of depth-dependence and periods of depth-independence in the subtidal variability of the coastal flow (Figure's 1 and 1c). The depth-dependent subtidal flow appeared during roughly the first month of the record and was probably driven by an offshore baroclinic pressure gradient that was modulated by fortnightly tidal mixing. The passage of wind events and tropical storms over the area may have weakened the gradient. This was marked by subtidal sea-level increases and the flow becoming depth-independent towards the north, in the direction of the wind, while advecting warm water from the south. Isolated wind events were identified by increased subtidal flow magnitudes and by variations in water temperature that reflected the direction of the wind. This information will be used by Eugenio Gomez to calibrate a regional circulation model that will study the transport of particles that enter and/or leave the lagoons and allow for a better management of the shrimp fishery in the region around Mazatlan.

During the last week of October, Arnoldo went to La Paz, Baja California Sur, to collaborate with scientists from the recently established CICESE station there. Arnoldo worked with Guillermo Gutierrez in preliminary numerical model runs that will assess the effects on circulation of water withdrawal from a coastal lagoon in that state. In the future, water might be withdrawn from the lagoon and could be placed in evaporative basins to produce salt. Arnoldo also interacted with Armando Trasvina to explore the potential for exchanges of personnel and collaborations to study diverse oceanographic aspects related to a sea mount in the southern Gulf of California. The sea mount is located approximately 15 km off the coast of La Paz, is 300 m in diameter, 16 m deep at its shallowest point, and has side slopes of approximately 0.5--a paradise for divers and fishermen!

Notes from the Director

Marine Transportation and Coastal Oceanography

In middle November, I attended the National Conference on the U.S. Marine Transportation System. It was unique for me if for no other fact that I was the only university person there among CEO's, presidents, assistant secretaries, generals, and admirals. Although the discussion focused on how our marine transportation system will meet the tripling demands in the coming 20 years, the issues of environmental protection were of great concern.

The projections for marine transportation are that the amount of cargo (container, bulk, etc.) will triple by the year 2020. To accommodate this, our ports must make huge adjustments that will include more land area dedicated to port activities and enlarged and deepened channels. The panels recommended that environmental issues such as these be in the planning process from the beginning.

Understanding oceanographic processes in ports and harbors is going to be critical to permit undue environmental impact while accommodating maritime traffic growth. We must understand the effect of constricting and deepening

channels on circulation and sedimentation. Circulation and sedimentation have both economic and ecosystem impacts that we must understand.

I hope that research institutions, governmental agencies, and commercial interests will soon combine their talents to address the environmental issues related to port development before the planning proceeds too far.

Larry P. Atkinson
Director, Center for Coastal Physical Oceanography

CCPO Goes to Space

A bit of CCPO went "out of this world" at 6:06:24 p.m., June 2, 1998, when a sticker, with the department logo, was flown on the space shuttle, *Discovery*, as part of mission STS-91. This was the last shuttle mission to pick up a U.S. astronaut from the Mir space station. The mission carried a crew of six (seven on descent), including Navy Commander Wendy Lawrence, a friend of CCPO graduate student, **KRIS HOLDERIED**. Shuttle crew members can "fly" a certain number of small items on each mission, and Wendy was kind enough to take something from CCPO up on the *Discovery* mission.

CCPO wasn't about to miss this opportunity. Finding an item to send was the first hurdle, since there was no CCPO logo item available that was small and lightweight enough for the flight. A patch was considered, but it would have taken too long to make, so **Kris** and **CAROLE BLETT** (CCPO administrator) came up with the idea of the sticker. With the assistance of **Karen Smallets**, ODU Graphics Services, stickers with the CCPO logo were designed and produced just in time to make the space flight.

Additionally, accepted Wendy's invitation to visit Cape Canaveral to watch the *Discovery* launching, which Kris said was "a truly spectacular event"! After a nine-day journey in space, the result can be seen hanging in the formal lounge of CCPO's facility, Crittenton Hall. Here the sticker, as well as a small American flag that was flown on the mission, are displayed and mounted along with pictures of the crew and the launching of the shuttle. The display (pictured) was also signed by each of the *Discovery* crew members.

For more details on the STS-91 mission, go to NASA's Office of Space Flight website at http://www.hq.nasa.gov/osf/.

COMMUNITY OUTREACH: Thomas Jefferson High school of Science and Technology

Three students from the Thomas Jefferson High School of Science and Technology (TJHSST) visited CCPO on October 12, 1998. The students, **Lara Maksymonko**, **Leslie Braitsch**, and **Katie Lovejoy**, are physical oceanography students enrolled in **Dr. John Fornshell's** oceanography class. TJHSST's program is for gifted science and mathematics students who are completing their fourth year of science and calculus. The students are working on their senior projects using data sets which were given to them by CCPO researchers.

During the students' visit, assistant professor, **ARNOLDO VALLE-LEVINSON**, spoke to the students on local and international oceanographic experiences. **RICARDO LOCARNINI**, research assistant professor, talked to the students about CCPO's Chesapeake Bay Monitoring Program, and **RUSSELL BURGETT**, research associate, thrilled the students by demonstrating how to use oceanographic research with virtual reality. The students then broke into one-on-one groups with researchers. **LARRY ATKINSON**, CCPO director, worked with Ms. Maksymonko on waves and beach interaction. Research associate professor, CHUNYAN LI, helped Ms. Braitsch with her research on the modification of tidal elevation by the wind. Research associate professor, **GLENN COTA**, interacted with Ms. Lovejoy on CZCS data. While students were meeting with researchers, **ELIZABETH SMITH**, assistant research professor, meet with Dr. Fornshell about satellite SST data. In the future, TJHSST students and CCPO researchers will

continue communication and collaboration on these projects through mail and email.

Dr. Fornshell commented that "without the assistance the students get from CCPO, TJHSST could not have a physical oceanography program." CCPO is proud to play such a large role in promoting physical oceanography at TJHSST, and CCPO looks forward to the next group of students coming to CCPO for a visit next year.

Top Photo: TJHSST students interact with CCPO researchers over lunch.
Bottom Photo: CCPO research assistant professor, Chunyan Li, assists student, Leslie Braitsch, with her research.

Sabbatical Cowboy

by A. D. Kirwan, Jr.

From mid January until August 1, 1998, I was a visitor in the Department of Mechanical Engineering at the University of Wyoming. The visit was my first ever sabbatical. Some might find it curious for an oceanographer to spend a sabbatical at an university 1,000 miles from the ocean. The reality is that both mechancial engineering and physical oceanography are multidisciplinary, and so there are plenty of areas for overlap. More importantly, the visit gave me an opportunity to learn some new technology.

When I applied for the sabbatical in the Spring of 1997, I only knew one person in the department, the chairman, Bill Lindberg. Our association dates back to the early 1970s when he was doing some interesting research on thermally-driven convection. The University of Wyoming is well known to many physical oceanogrphers since Don Boyer, an eminent ocean modeler, serve many years as the chairman of the department before moving to Arizona. Don and I have known each other for over 25 years. Through him, I had a standing invitation to visit Wyoming. Of course I never expected to follow up on the invitation after he left.

Just getting to Laramie in January was an adventure. My wife, Dede, and Jack Russell terrier, Roxanne, drove 2,000 miles through sun, rain, sleet, snow, and hail. The last 20 miles was through a whiteout on I-80. We rented an apartment less than half a block from the campus. During the spring semester, three lady music majors lived below us. They had some great parties. When the semester ended, a delightful couple from Canada, Roger and Liz Bragg, moved into that apartment. Roger is a retired geography teacher and Liz is a poet. They often dog-sat Roxanne so a keen competition quickly developed for her affections.

My arrangements in the department were ideal. The faulty and staff were very helpful, and I felt at home immediately. My host, Professor Andy Hanson, bought a new fully loaded Gateway on a grant, which became my workstation. This gave me some experience with the NT operating system.

Dean of Engineering, Ken Pell, was particularly kind. He often stopped by late in the afternoon just to chat about his problems, my problems, and problems of academia. He invited me to the College Advisory Council meeting, which is composed of outstanding graduates of the college, successful business men from the state, and the governor. At the council banquet, Dede and I sat with a former Wyoming senator and the director of the Apollo 13 mission who was a graduate of the college. I had an opportunity to talk with the governor and was impressed with his commitment to higher education. I also attended the awards banquet for the College as guest of the dean. It was clear from both the nature and number of awards the college maintains high academic standards for its undergraduates. It was also impressive to learn of the large number of undergraduate scholarships. The minimum scholarship stipend is 1,000!

Through Dean Pell and Bill Linberg, I got involved in a project to design a sled for the next winter Olympics. It seems a University of Wyoming graduate is one of three team drivers for the US Olympic sled team. He felt the US has the best athletes but is "out-teched" by European teams in the Olympics. Our goal is to close this technology gap. My perk was the opportunity to make some test runs with the new sled this coming winter at the winter training facilities in Utah. Unfortunately duties here at CCPO likely will prevent me from seizing this once in a lifetime opportunity.

The football stadium has a huge sign saying "Welcome to 7200 feet," which greets opposing teams when they run out on the field. The high altitude, plus being surrounded by mountains, can cause some rugged weather in Laramie and the surrounding area. Several times, we were completely isolated by blizzards. Old timers told me not to worry until the fifth day when the beer would start to run out, then things would get really nasty. Fortunately that didn't happen in 1998.

Thanks to internet my day in the office was much like one at CCPO. I was in regular communication with my CCPO collaborators, **CHET GROSCH**, **BRUCE LIPPHARDT**, and **JOHN HOLDZKOM**, and so my research efforts proceeded on schedule (well maybe faster since I wasn't around to clog up progress).

During the spring semester, I submitted two proposals that were funded and John Holdzkom defended his dissertation and graduated. I also updated notes for an undergraduate acoustics course and the graduate course on perturbation methods. My class students, **ANDRES SEPULVEDA** and **ISAAC SCHROEDER**, are the beta tests for the latter.

The real reason for going to the University of Wyoming was the opportunity to work with Professor Andy Hanson. Several years ago Andy published some important theoretical work on the dynamics of mixtures. The basic idea in his approach is to treat all mixture constituents in proportion to the amount of volume of the mixture they occupy. It appeared to me his approach could be applied to problems of sediment transport. I had also been active in mixture dynamics many years ago, and I hoped that together we could make some important conceptual advances. Because of our mutual interests we had maintained some correspondence so when the possibility of a sabbatical arose he immediately revived Don Boyer's earlier invitation.

Andy, Carl Reid (a young faculty member), and I developed a routine of meeting once or twice a week to discuss the dynamics of mixtures. The meetings would usually start off with me giving a talk on some a priori selected aspect of research in this area or review a paper. But typically penetrating questions were quickly raised, and often we would end up at the blackboard arguing amongst ourselves about a different aspect of mixture dynamics. I found I was preparing for these sessions as just as I would for a class.

These sessions were among the most intellectually stimulating experiences I have ever had. Andy and Carl applied the same ideas about the dynamics of mixtures to composites as I did for sediment transport by fluids. For them, an important special case turned out to be the fluid mechanics equivalent of no mixing. We made considerable progress in these sessions in learning what is wrong with everyone else's research. For my next sabbatical, we intend to show how to do these problems correctly.

Dede and I also used this period to ski, travel a bit in Wyoming, and to learn about the state's history. Laramie is ideally located for skiing of any type. The great slopes in Colorado are just a couple of hours away. There is also an excellent downhill facility in the Snowy Mountains, less than 30 minutes from Laramie. Often we would leave the apartment and 15 minutes later be cross-country skiing in breathtaking scenery in the Happy Jack Mountains.

When the spring thaw came, officially Memorial Day, we took a number of weekend trips to Devil's Tower, Fort Laramie (about 150 miles from Laramie), and the Bad Lands and Black Hills in South Dakota. We also made longer trips to Yellowstone, the Grand Tetons, and to Custer's last stand at the Little Bighorn a few miles across the border in Montana. The grandeur and beauty of Yellowstone and the Grand Tetons cannot be overstated. We hiked extensively at both parks and even managed to climb Avalanche Peak in Yellowstone (altitude 12,500 feet). I was quite moved by the Little Big Horn and have started researching that battle.

Wyoming is the eighth largest state, has abundant mineral deposits (coal, oil, gas, uranium, and many commercial clay mineral deposits), and major tributaries for both the Missouri and the Columbia rivers start there. Despite these abundant natural resources, the state's economy is near the bottom in per capita income. Mining has left huge scars and major water rights are controlled by Idaho and Nebraska. The state exports much of its natural resources and much of the resulting wealth also leaves the state.

Wyoming had an unusual and often violent history. It was the site of some of the bloodiest fighting in the Indian and range wars. As I read about these, I realized that many of the plots of westerns were based on actual events from Wyoming's history. Wyoming also has some significant progressive achievements. Yellowstone was the world's first

national park. Wyoming was the first state to give women the right to vote and the first state to elect a woman mayor and governor.

Puzzler

The purpose of the Puzzler is to record thought-provoking questions and problems that have appeared on comprehensive, qualifying, and candidacy exams. Readers are encouraged to submit their own favorites, as well as to attempt to answer all questions. All communications should be directed to: **wizzard@ccpo.odu.edu**. *Wizzard* will acknowledge the sources of all questions/problems used and will publish selected throught-provoking (not necessarily correct) answers to previous submissions. Before posing this issue's Puzzler question (Question 98.4), *Wizzard* would first like to answer last issue's Puzzler, Question 98.3.

Question 98.3. This problem is an adaptation of one given on *Wizzard's* oral. While driving a panel pickup, a liberal arts major, LAM, was ticketed by the police for blocking traffic. In court, LAM pleaded innocent because of extenuating circumstances. The truck was rated for 2 tons but was carrying 4,001 pounds of pigeons. LAM claimed it was necessary to stop every 100 yards, get out of the cab, and beat on the panels to keep the pigeons from roosting so the axle wouldn't break. Should the judge accept this excuse? Would it make any difference if the truck had open, screened sides?

Answer to Question 98.3. A jury composed of *lou@ccpo.odu.edu*, *ramey@ccpo.odu.edu*, and *haskell@ccpo.odu.edu* has returned with an unanimous verdict: GUILTY. Liberal Arts Major (LAM) is sentenced to a year of thermodynamics and statistical mechanics taught by *Wizzard*. The August panel of peers concluded that the downward force exerted by the pigeons while flying is at least as great as that exerted when they are roosting. Thus, the excuse for stopping on the interstate is not valid. *lou* also noted that the pigeons are constantly converting solid biomass to and gas and liquid while flying. If LAM had made the birds fly just a bit before putting them in the truck, they could roost or fly without breaking the axle.

Question 98.4. Question 98.4 is a problem submitted by Louis A. Codispoti, research professor at CCPO. Lou says that an albatross is excellent at soaring flight, and so is a vulture. Why then does the albatross have high aspect ratio wings and the vulture low aspect ratio wings? Please email wizzard your answer.

1999 Blue Crab/National Ocean Sciences Bowl

The second annual Blue Crab Bowl, the Virginia regional competition of the National Ocean Sciences Bowl (NOSB), will take place at the Virginia Institute of Marine Science (VIMS) in Gloucester Point, VA on Saturday, February 27, 1999. The Blue Crab Bowl is a rapid-fire, question/answer format competition among teams of high school students, designed to challenge their knowledge of all facets of oceanography. Once again, ODU's Department of Ocean, Earth and Atmospheric Sciences (OEAS) and CCPO, together with VIMS are co-hosting this event for teams from 16 Virginia high schools. The winning team will receive prizes and an all-expense paid trip to Washington, DC to represent Virginia at the national competition on April 9-12, 1999.

Competition teams consist of five students (four competitors and one alternate) and a coach. Multiple-choice or short-answer questions will come from the scientific and technical ocean science disciplines: physics, chemistry, geology, atmospheric science, biology, etc., as well as from topics on ocean-related national and international economics, history, and culture. Regional competitions will also be held during February at North Carolina State University and at the National Aquarium in Baltimore, as well as in 15 other locations around the country including Alaska!

Sample NOSB Question:

Along mid-Atlantic ocean beaches, most of the sand is composed of:

(W) volcanic debris
(X) coral
(Y) organic materials
(Z) quartz

NOSB is sponsored by the Consortium for Oceanographic Research and Education (CORE), in partnership with the National Marine Educators Association and the Oceanographer of the Navy, Office of Naval Research, National Aeronautical and Space Administration, National Science Foundation, and the National Oceanic and Atmospheric Administration.

More information about the NOSB can be found on CORE's website: http://core.cast.msstate.edu/NOSBtop.html.

Salinity Measurements in the Coastal Ocean

On September 14-15, the Center for Coastal Physical Oceanography (CCPO) and the NOAA National Data Buoy Center (NDBC), Stennis hosted a salinity workshop in Hampton, Virginia. The workshop was a result of discussions with workshop chairs, **LARRY ATKINSON**, CCPO director, and **CATHERINE WOODY** of NDBC. Larry and Cathy felt that the importance of salinity measurements in the coastal ocean has long been neglected. The frequency of such measurements has decreased considerably in the past years due to automation of water level stations and light ships. Researchers are now in a situation where salinity measurements are made routinely at very few places and there is no logical plan for where salinity measurements should be made or how frequently. Many researchers feel it is urgent that the U.S. initiate a modest salinity measuring program using existing technology and locations and develop new technology to expand measurement programs.

Many presentations were given by participants of the workshop. From presentations and discussions, workshop participants successfully addressed the immediate national needs for salinity measurements in the coastal ocean. Participants were able to establish the need for acceptable techniques based on needed accuracy and expense; establish criteria for location and frequency of salinity measurements; begin to inventory all existing coastal salinity measurements; identify users of coastal salinity and derivative data (density, stratification, and coastal currents); and determine requirements new technology should address.

As a result, participants felt the need to address some of these issues in a workshop proceedings due to be published in 1999.

CCPO Seminar Series: Spring 1999

During the academic year, CCPO invites several distinguished scientists to present seminars on topics related to coastal oceanography. The lectures take place in Room 109, Crittenton Hall, Old Dominion University on Mondays at 3:30 p.m. **EILEEN HOFMANN**, professor of oceanography, coordinates the lecture series. Below is a schedule of lectures for the fall semester 1998. For more information or to be included on the mailing list for lecture announcements, please contact **Carole Blett**, CCPO administrator, at (757) 683-4945 or carole@ccpo.odu.edu. Specific lecture topics are announced one week prior to each lecture. Titles and abstracts of the seminars can be found at http://www.ccpo.odu.edu.

Date	Lecturer	Institute
February 1, 1999	**Dennis McGillicuddy, Jr.**	*Woods Hole Oceanographic Inst.*
February 8, 1999	**Dennis Blanton**	*College of William and Mary*
February 15, 1999	**John Klinck**	*Ctr Coastal Physical Oceanography*

February 22, 1999	**Eileen Hofmann**	*Ctr Coastal Physical Oceanography*
March 1, 1999	**Cristobal Reyes**	*Ctr Coastal Physical Oceanography*
March 15, 1999	**Beth Clark**	*The Antarctica Project*
March 22, 1999	**Michael Orbach**	*Duke University Marine Laboratory*
March 29, 1999	**Sylvie Mathot**	*Virginia Institute of Marine Science*
April 5, 1999	**A. D. Kirwan, Jr.**	*Ctr Coastal Physical Oceanography*
April 12, 1999	**Stan Wilson**	*NOAA/National Ocean Service*
April 19, 1999	**Bettina Fach**	*Ctr Coastal Physical Oceanography*

Just the *facts* . . .

Announcements

R. LOCARNINI, assistant research professor, and his wife, Sally Jo Locarnini, welcome baby girl, Emma Julia, born October 9, 1998.

Appointments

L. P. ATKINSON inducted into the Board of Oceans and Atmospheres of the National Association of State Universities and Land Grant Colleges (NASULGC), November 15, 1998.

T. ROYER, U.S. Representative to the PICES Technical Committee on Data Exchange (TCODE) and TCODE Liaison with the PICES Monitoring Working Group.

E. E. HOFMANN, Editorial Board of *Polar Biology*.

Grants/Contracts Awarded

L. P. ATKINSON, "User Forum to Present the Preliminary Finds of a User Requirements Analysis," $5,000, National Oceanic and Atmospheric Administration.

G. F. COTA, "Remote Sensing of Ocean Color in the Arctic: Algorithm Development and Comparative Validation," $211,560, National Aeronautical and Space Administration.

E. E. HOFMANN, "Southern Ocean GLOBEC Planning Workshop," $45,000, National Science Foundation.

A. D. KIRWAN, Jr., "Enhanced Ocean Predictability Through Optimal Observing Strategies," $300,000, Office of Naval Research.

A. D. KIRWAN, Jr. and **B. L. LIPPHARDT, Jr.**, "Merging Disparate Data and Numerical Model Results for Nowcasts in Littoral Zones and Semi-Enclosed Seas," $225,000, Office of Naval Research.

T. C. ROYER, "Assisting in Collection and Analysis of Physical Oceanographic Data During the GLOBEC Cruises," $55,199, University of Alaska.

E. A. SMITH, "Studying Earth's Environment From Space: Classroom and Laboratory Activities for Undergraduate Science Classes," $85,567, National Aeronautics and Space Administration.

A. VALLE-LEVINSON, "ADCP Current Measurements," $15,000, Hampton Roads Sanitation Department.

A. VALLE-LEVINSON, "On the Wind-Induced Exchange Between an Estuary and the Adjacent Continental Shelf," $90,989, National Science Foundation. Co-PIs are Kate Bosley, NOAA/National Ocean Service, and K.-C. Wong, University of Delaware.

G. H. WHELESS and **C. M. LASCARA**, "Web Based Interaction with 3D Environmental Data Sets Using Virtual Reality Modeling Language," $50,990, National Oceanic and Atmospheric Administration.

G. H. WHELESS, **C. M. LASCARA**, and **D. Harnage** of Office of Finance, Old Dominion University, "A Visual Supercomputing Facility for Rapid Environmental Assessment," $113,929, National Science Foundation.

Presentations

G. F. COTA, "High Latitude Bio-Optical Algorithms," SIMBIOS Meeting, San Diego, CA, September 22-24, 1998.

G. F. COTA, "High Latitude Bio-Optical Algorithms," GLI Meeting, Tokyo, Japan, September 9-11, 1998.

T. S. Platt and G. Harrison, both from Bedford Institute of Oceanography; and **G. F. COTA**, "Remote Sensing of Labrador Sea: Results from the OCTS Experiment," Community on Space Research (COSPAR) Meeting, Nagoya, Japan, July 12-19, 1998.

L. W. Cooper, Oak Ridge National Laboratory; S. S. Dolvin, University of Tennessee; I. Larsen, Oak Ridge National Laboratory; V. Woshner, University of Illinois; T. O'Hara, Department of Wildlife Management, Barrow, AK; **G. F. COTA**; and J. M. Grebmeier, University of Tennessee, "Anthropogenic Radionuclide Burdens in Arctic Marine Mammals Harvested During Subsistence Hunting," ASLO Meeting, St. Louis, MO, June 1998.

G. F. COTA; T. Platt and S. Sathyendranath, both from Bedford Institute of Oceanography; W. G. Harrison, Bedford Institute of Oceanography, "Remote Sensing of Ocean Color and Sea Surface Temperature in the Labrador Sea," Canadian Meteorological and Oceanographic Society Meeting, Dartmouth, Nova Scotia, June 1-4, 1998.

G. F. COTA and W. G. Harrison, Bedford Institute of Oceanography, "Climate-Driven Variability of Primary Productivity in the Northwest Passage," Canadian Meteorological and Oceanographic Society Meeting, Dartmouth, Nova Scotia, June 1-4, 1998.

W. D. Thacker, Saint Louis University; T. B. Gatski, NASA Langley Research Center; and **C. E. GROSCH**, "Transport Equations of Turbulence and Linear Disturbances in Decaying Flows," Amer. Phys. Soc., Philadelphia, PA, 1998.

J. M. KLINCK, **E. E. HOFMANN**, and S. Ford and E. N. Powell, both Rutgers University, "Modeling the MSX Parasite in Eastern Oyster (*Crassostrea virginica*) Populations: Chesapeake Bay and Delaware Bay Comparisons," the International Conference on Shellfish Restoration, Hilton Head, SC, November 19, 1998.

E. E. HOFMANN, **J. M. KLINCK**, and S. Ford and E. N. Powell, both Rutgers University, "Modeling the MSX Parasite in Eastern Oyster (*Crassostrea virginica*) Populations: Model Development, Implementation and Verification," the International Conference on Shellfish Restoration, Hilton Head, SC, November 19, 1998.

E. E. HOFMANN, "Environmental and Biological Interactions and Consequences for Larval Transport," Oceanography Department seminar, Texas A&M University, Galveston, TX, November 2, 1998.

A. D. KIRWAN, Jr., "Enhanced Ocean Predictability Through Optimal Observing Strategies," Office of Naval Research Workshop on Predictability," Naval Research Laboratory, Monterey, CA, November 6, 1998.

C.-Y. LI; **A. Valle-Levinson**; K.-C. Wong, University of Delaware; and K. M. M. Lwiza, State University of New York, Stony Brook, "Estuarine Tides--Bridging Data and Model," University of Delaware, Newark, DE, November 9, 1998.

C.-Y. LI; **A. Valle-Levinson**; K.-C. Wong, University of Delaware; and K. M. M. Lwiza, State University of New York, Stony Brook, "Estuarine-coastal Exchange Processes: Theories and Observations," Institute of Oceanology, Qingdao, China, July 27, 1998.

T. C. ROYER, "Salinity - Why Bother?" the Salinity Measurements in the Coastal Ocean, Hampton, VA, September 14-15, 1998.

T. C. ROYER and T. Weingartner, University of Alaska-Fairbanks, "Coastal Hydrographic Responses in the Northern Gulf of Alaska to the 1997-8 ENSO Event," the PICES Science Board Symposium, and also at the 7th Annual PICES (North Pacific Marine Science Organization) meeting, October 14-25, 1998, Fairbanks, Alaska.

E. A. SMITH, "Using Chesapeake Bay Water Quality Data in the Classroom," Teacher Workshop for the Cooperating Hampton Roads Organizations for Minorities in Engineering (CHROME), Old Dominion University, Norfolk, VA, October 2, 1998.

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ADK's Words of Wisdom

"The difference between the amoeba and Einstein is that, although both make use of the method of trail and error or elimination, the amoeba dislikes erring while Einstein is intrigued by it; he consciously researches for his errors in the hope of learning by their discovery and elimination."

Karl Popper, 1979, as quoted by Raphael Sassower in *Cultural Collisions: Postmodern Technoscience* (Rutledge)

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